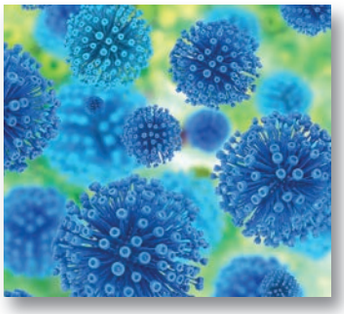

CASE REPORT

FINGER PAD SQUAMOUS CELL CARCINOMA: Report of Squamous Cell Carcinoma of the Distal Palmar Digit and Review of Associated Risk Factors, Mimickers, and Treatment of Squamous Cell Carcinoma of Ventral Hand Digits

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ABSTRACT

BACKGROUND: Squamous cell carcinoma of the palmar digits is rare. **PURPOSE:** The authors describe a man with squamous cell carcinoma of the pulp of his left fourth finger, and review the risk factors that may be associated with squamous cell carcinoma development on the ventral digits of the hand. The authors also summarize the clinical differential diagnoses and treatment of squamous cell carcinoma at this location. **METHODS:** The authors retrospectively reviewed the literature using PubMed and searched for the following terms: *squamous cell carcinoma, squamous cell carcinoma in situ, finger, thumb, palmar,* and *ventral*. Papers were critically evaluated and their cited references reviewed. **RESULTS:** Skin biopsy established the patient's diagnosis. His tumor was excised using Mohs technique with microscopic examination of the tissue margins; viral changes were noted in the keratinocytes. Local or systemic carcinogen exposure, congenital conditions, suppressed host immunity, coincidental bacterial or viral infection, local radiation exposure, and trauma to the affected digit are risk factors associated with the development of palmar digit squamous cell carcinoma. The clinical differential diagnoses of squamous cell carcinoma on the ventral digits include chronic dermatitis and keratoderma, epidermoid cyst, infection, melanoma, and verrucae. Successful treatment involves removal of the tumor; this is usually accomplished by surgical excision of the tumor, which may include some or all of the affected digit. **CONCLUSIONS:** The diagnosis of squamous cell carcinoma of the ventral hand digits is often not initially suspected by the patient and/or the clinician. However, despite the occasional delay in diagnosis or subsequent large tumor size, the prognosis for these patients is usually favorable following adequate treatment of the cancer.

KEYWORDS: Carcinoma, cell, digit, distal, finger, pad, palmar, squamous, ventral

CUTANEOUS SQUAMOUS CELL CARCINOMA (SCC) is a nonmelanoma skin cancer (NMSC) that typically occurs on sun-exposed skin. In contrast, SCC and SCC *in situ* of the palmar aspect of the hand digits are rare. A man with SCC of the distal pad of his left fourth finger is described and features associated with SCC of the ventral finger are reviewed.

CASE REPORT

A 62-year-old, Fitzpatrick type I, Caucasian man presented with a mass on the palmar aspect of his left fourth finger pulp. The lesion had been originally noted five years earlier and interpreted by the patient to be a wart. It progressively enlarged in size and was often painful.

Cutaneous examination showed a 20mmx15mm verrucous plaque that nearly occupied the entire ventral surface of the left fourth finger from the distal interphalangeal joint to the tip of the finger (Figure 1). There was no axillary lymphadenopathy. A 3mm punch biopsy was performed, and the histopathology showed SCC, with invasion of atypical keratinizing epithelium into the underlying dermis.

The residual cancer (Figure 2) was removed by Mohs surgery using the frozen-tissue technique. Five stages were required to clear the tumor. Microscopic review of the surgical specimen not only showed full-thickness keratinocyte atypia within the epidermis with islands of atypical squamous cells invading the dermis (Figure 3) but also cytologic features consistent with human papillomavirus (HPV) changes within the keratinocytes (Figure 4).

The resulting wound (Figure 5) was repaired using a full-thickness skin graft derived from the

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left lower quadrant of his abdomen. The donor and recipient sites healed without any complications. His follow-up physical examination two months later showed no evidence of tumor (Figure 6).

DISCUSSION

SCC of the ventral fingers. SCC of the dorsal hand is common. In contrast, periungual and distal dorsal finger SCC—often associated with HPV—is only occasionally observed.[1–4] SCC on the nonsun-exposed ventral fingers is rare.

Risk factors for SCC of the ventral fingers. Previously documented risk factors for SCC include arsenic ingestion, chronic scars, chronic ulcers, HPV infection, radiation therapy, reduced immunity, trauma, and ultraviolet light (e.g., sun) exposure.[5–7] With the exception of sun exposure (which is unlikely to chronically occur to the palmar surface of the fingers), these and other risk factors have been observed in individuals with SCC of the ventral fingers (Table 1).[6–26]

Carcinogen exposure. Exposure to carcinogens can result in malignancy. Palmar digit SCC occurred in individuals exposed to arsenic, grease and oil, or "soluble oil."[6–9] A 49-year-old man with psoriasis and a long history of exposure to arsenic from herbal medicines developed an SCC *in situ* on his distal palmar right fifth finger.[7] Another individual with chronic arsenism, a 74-year-old Taiwanese man, also developed an SCC on the distal pad of his right index finger.[6]

Exposure to oil contributed to SCC developing on the ventral left thumb of a 59-year-old truck mechanic with extensive contact with grease and oil and recurrent episodes of trauma to the digit.[8] Soluble-oil metalworking fluids, which contain emulsified naphthenic or paraffinic oils in water, are used for cooling and lubrication of cutting tools and the working surface. A 77-year-old man, who was employed for 50 years as a metal lathe turner working with soluble oil, developed SCCs of both ventral thumbs and five palmar digits.[9]

Congenital condition. Epidermolysis bullosa, Huriez syndrome, and syndactyly are congenital conditions that have been associated with the subsequent development of palmar digit SCC in adulthood. Recessive dystrophic epidermolysis bullosa is a rare heritable blistering disorder characterized by subepidermal blisters that often involve the fingers and the potential for skin cancer to develop in the chronic scar tissue. A 51-year-old woman with non-Hallopeau-Siemens recessive dystrophic epidermolysis bullosa developed an SCC involving both the ventral and dorsal surfaces of her right fourth finger.[10] SCCs also occurred in identical twins with recessive epidermolysis bullosa.[11]

Huriez syndrome is a rare autosomal dominant genodermatosis characterized by congenital scleroatrophy of the palms and soles, palmoplantar keratoderma, and nail changes; nonfamilial patients with Huriez syndrome have also been reported.[12,13] A 31-year-old Japanese woman with nonfamilial Huriez syndrome and palmoplantar keratoderma since birth developed an SCC on her left palmar thumb and SCC *in situ* on her right palmar thumb.[13] In addition, a 27-year-old Indian man with nonfamilial Huriez syndrome developed an SCC on the palmar surface of his left thumb.[12]

Syndactyly, the most common congenital abnormality of the hand, is classified as a failure of differentiation. An 81-year-old man with bilateral incomplete simple syndactyly involving the web space between his third and fourth fingers on both hands presented with verrucous SCCs affecting both the left and right palmar web spaces.[14]

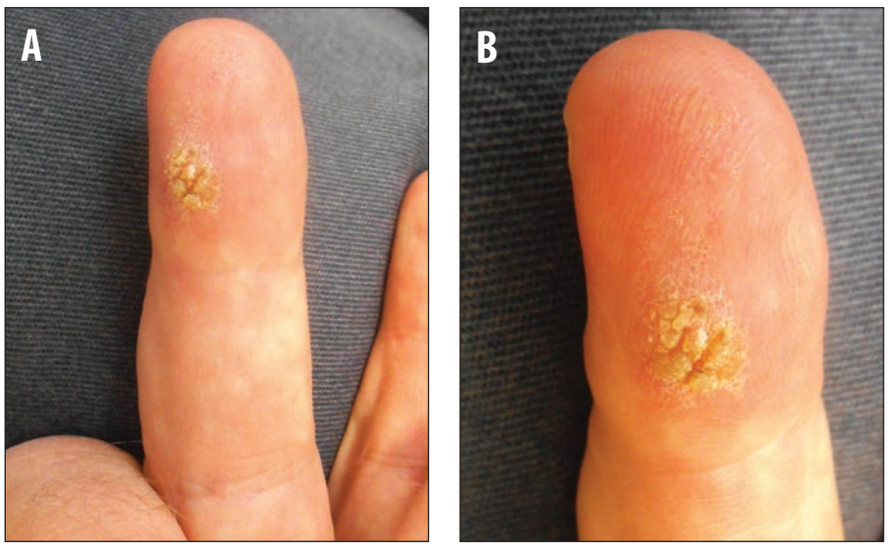

FIGURE 1. Distant (A) and close (B) views of squamous cell carcinoma presenting as a verrucous plaque on the ventral surface of the patient's left fourth finger nearly occupying the entire pulp of the digit from the distal phalangeal joint to the finger tip.

FIGURE 2. Preoperative clinical delineation of squamous cell carcinoma on the distal ventral left fourth finger. The inferior/proximal circle circumscribes an elevated plaque of residual tumor. The superior/distal circle circumscribes subtle epidermal change that is also clinically suspicious for residual tumor.

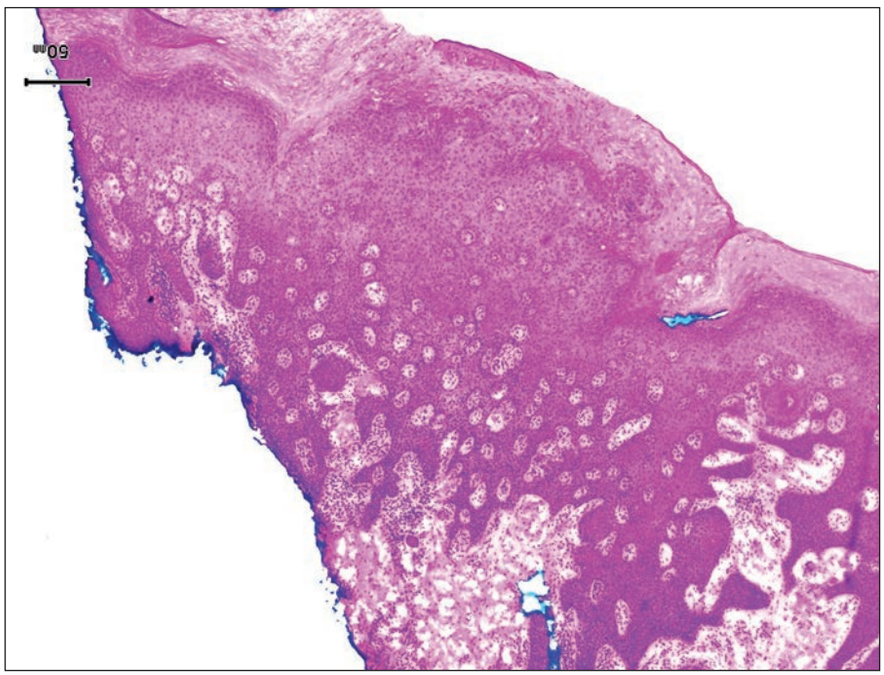

FIGURE 3. Mohs histology showing squamous cell carcinoma characterized by atypical keratinizing epithelium throughout the epidermis and invading into the dermis (hematoxylin & eosin, x4)

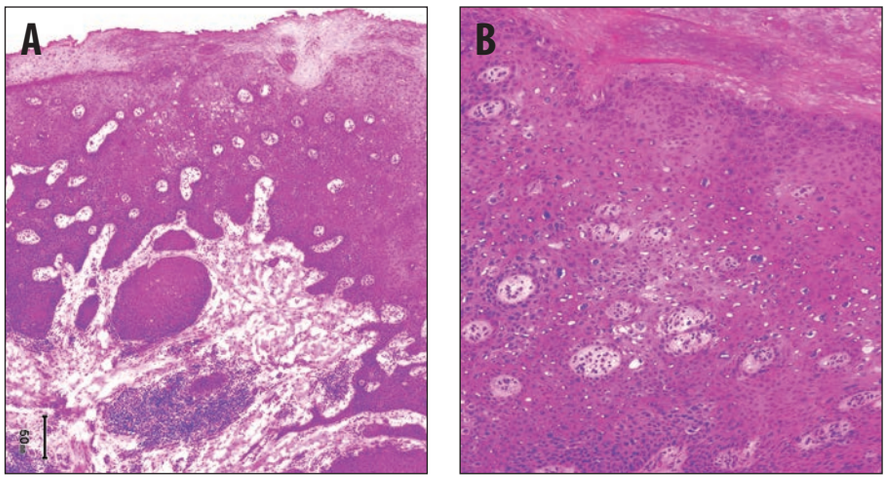

FIGURE 4. Mohs histology showing distant (A) and close (B) views of squamous cell carcinoma with associated viral changes: koilocytic features are noted within the keratinocytes (hematoxylin & eosin: A, ×4; B, ×10)

TABLE 1. Squamous cell carcinoma of the ventral hand digits: causes with associated risk factors

CAUSE	RISK FACTOR
Carcinogen exposure	• Arsenic[6,7] • Grease and oil[8] • Soluble oil[9]
Congenital condition	• Epidermolysis bullosa[10,11] • Huriez syndrome[12,13] • Syndactyly[14]
Immunosuppressed host	• Post transplant[15]
Infection	• Bacterial -Osteomyelitis[16] -Soft tissue[17] • Viral (human papillomavirus-related) (current report)[15,18,19]
Radiation exposure	• Radiopharmaceutical exposure[20] • Radiotherapy exposure[21–23] • Ultraviolet A and psoralen[7]
Trauma	• Amputation stump[24] • Hammer blow[25] • Friction-associated[14] • Laceration[26] • Wood splinter injury[16] • Wound while working with wet concrete[17]

Immunosuppressed host. A suppressed immune system is a risk factor for the development of NMSCs. Immunosuppression may be congenital or acquired; the latter can be associated with infection (such as human immunodeficiency virus [HIV]) or iatrogenic (following organ transplant). A cardiac transplant patient developed SCC *in situ* of the finger and bowenoid papulosis of the perianal area. HPV Type 16 was detected from both the tumor and the perianal lesion. The investigators hypothesized contact transmission of the viral-associated cancer of the finger.[15]

Infection. Chronic bacterial or viral infection has also been observed to precede the development of ventral digit SCC. Recurrent bacterial infections preceded the eventual diagnosis of SCC in a 60-year-old man following wood splinter injury to his left palmar thumb[16] and in a 33-year-old man who sustained a small wound to the ventral aspect of his right index finger while working with wet concrete without gloves.[17]

Our patient's SCC demonstrated viral changes and is therefore likely to be associated with a preceding HPV infection.

Other cases of men with palmar digit SCC *in situ* have been reported; many of these individuals (or their sexual partners) also had genital SCC *in situ* associated with the same HPV type.[15,18,19] In addition, women with subungual and/or dorsal finger HPV associated SCC *in situ* have been described to also have genital dysplasia secondary to the same virus.[1,27,28]

A 60-year-old man with a hypertrophic scaling plaque on his volar and medial finger was documented to have HPV Type 16, by *in-situ* deoxyribonucleic acid (DNA) hybridization, in the SCC *in situ* from both his digit and penis.[19] HPV Type 16 was also confirmed by *in-situ* hybridization and polymerase chain reaction in the SCC *in situ* of the finger and the bowenoid papulosis of the perianal area of a cardiac transplant patient.[15] Excisional biopsy of a presumed recurrent wart on a nondominant finger of a 33-year-old man showed HPV Type 16-associated SCC *in situ*; additional history revealed that his female partner previously had viral-related cervical lesions.[18]

Radiation exposure. SCC of the palmar finger has been observed in patients exposed to radiation.[7,20–23] This includes not only exposure to radiopharmaceuticals and ionizing radiation but also exposure to ultraviolet A radiation: 1) a nurse who worked for five years in a metabolic radiotherapy unit preparing the injectable substances (e.g., thallium and metastable technetium 99) and administering radioactive tablets for thyroid tumor therapy developed an SCC *in situ* on the right proximal palmar third finger five years later;[20] 2) a 75-year-old woman who worked for more than 30 years as an X-ray technologist holding newborns during radiological studies developed an SCC on the flexor surface of her right middle finger 15 years after retiring;[23] 3) a 63-year-old pediatrician who used radioscopy for 20 years in his practice and handled children without the protection of lead gloves, presented with a radiation-associated SCC *in situ* in addition to biopsy-confirmed chronic radiodermatitis of the distal palmar right middle finger;[21] and 4) a 49-year-old man with arsenic exposure whose psoriasis had been treated with psoralen and ultraviolet A radiation developed SCC *in situ* of his distal palmar right fifth finger.[7]

Trauma. Severe, repetitive, and/or chronic trauma to the affected digit has been observed in some of the individuals who subsequently developed SCC of the ventral surface of that digit.[14,16,17,24–26] The development of cancer at these sites of trauma is likely similar to the occurrence of cutaneous SCC observed in chronic scars, ulcers (Marjolin ulcers), or sinuses following trauma to the skin site. Chronic irritation to the affected area is postulated to promote malignant transformation.

The latency period between the initial injury and subsequent diagnosis of cancer in patients with Marjolin ulcers or similar injuries is typically long—often ranging from 20 to 30 years.[16,17,24] In contrast, the latency period between injury and cancer detection was shorter in five of the six patients with trauma-associated SCC of the ventral finger ranging from six months to 12 years (median=10 years).[16,17,24–26] However, in an 81-year-old man with congenital syndactyly and chronic skin changes as a result of friction, the latency period was over eight decades.[14] SCC of the pulp space of the left index finger developed in a roofer following repeat hammer blows to the same finger six months and 12 years earlier.[25] In addition, squamous cell carcinomas have subsequently developed at the sites of wound-producing injuries secondary to knife cut,[26] cement,[17] or splinter.[16]

Idiopathic SCC of the ventral fingers. SCC of the ventral finger has rarely been described in patients without an apparent tumor-associated risk factor. One patient had

FIGURE 5. Tumor-free wound after 5 Mohs stages

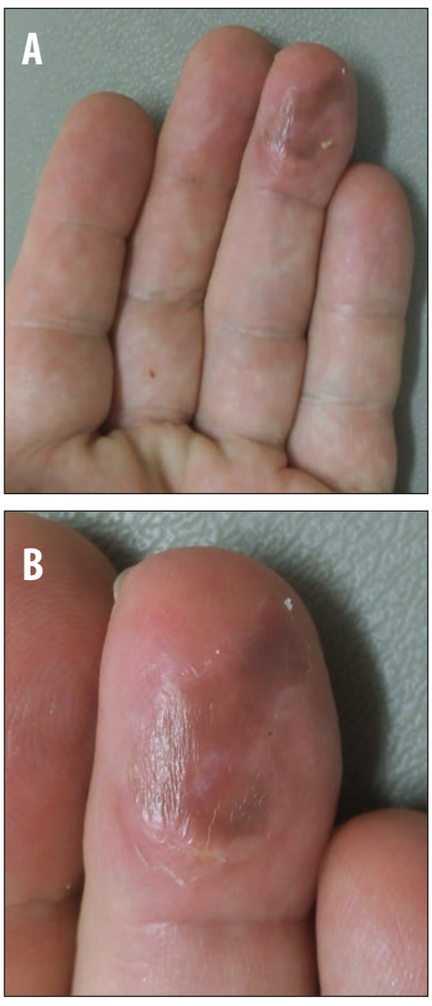

FIGURE 6. Distant (A) and close (B) views of distal ventral fourth finger showing complete healing of the wound 2 months after repair using a full-thickness skin graft

TABLE 2. Differential diagnoses of squamous cell carcinoma (SCC) of the ventral hand digits

DIAGNOSIS	CASE REPORT
Chronic dermatitis and keratoderma[13]	SCC *in situ* of the right ventral thumb tip presented as a well-circumscribed erythematous plaque, similar in appearance to biopsy-confirmed chronic dermatitis with keratoderma on the dorsal hands and fingers of a 40-year-old Japanese woman with nonfamilial Huriez syndrome.
Epidermoid cyst[25]	Pathology eventually confirmed the diagnosis of SCC in a 20-year-old roofer; the lesion was initially biopsied and diagnosed as a traumatically induced epidermoid cyst with a network of communicating sinuses; however, after additional repetitive hammer blows to the affected digit, the finger was amputated due to severe symptoms, and tumor was discovered.
Infection[16,17,23–25]	Tumors were interpreted as bacterial infection or coincidentally contained culture-positive pathogenic bacteria. The cancer typically presented as a draining[16,17,24] or dry[23,25] nonhealing ulcer. Clinically, the ulcerated tumors were initially considered to be cellulitis[23] or osteomyelitis;[16] indeed, most of the patients were treated—without success—with systemic antibiotics.[16,17,23,25] Even skin biopsies have been misleading; the discovery of pseudoepitheliomatous hyperplasia without accompanying keratinocyte atypia has prompted clinicians to entertain the possibility of mycobacterial[17,25] or deep fungal[17] infection to also be considered.
Melanoma[5]	Pigmented SCC *in situ* of the pulp of the right fourth finger in a 20-year-old white, Fitzpatrick type III, Iranian woman presented as an asymptomatic gradually enlarging lesion and had initially appeared 4 years earlier. [e]Several of the patients with pathologic diagnosis of ventral SCC had preceding lesions that were interpreted morphologically[18,20] or after biopsy[29] and subsequently treated[20] as warts.
Verruca (current report)[18,20,29]	The reported patient had a lesion on his fourth finger ventral surface, which he interpreted to be a wart of 5-year duration. A biopsy, once the lesion became symptomatic, established the correct diagnosis: in addition to squamous cell carcinoma, viral cytologic features consistent with human papillomavirus (HPV) infection were noted in the Mohs surgery specimen. HPV Type 16-associated squamous cell carcinoma in situ was discovered in the excision specimen of a presumed wart on the finger of a 33-year old.[18] Hence, squamous cell carcinoma of the palmar digit can not only mimic a verruca, but also demonstrate the presence of concurrent HPV infection as an etiologic factor.

TABLE 3. Treatment of squamous cell carcinoma of the ventral hand digits

SUCCESSFUL
Amputation Ray[13,14,16,17,23] *En bloc* at proximal joint[8,12,18,24,25]
Chemotherapy (postoperative)[12]
Excision Mohs with microscopic examination of margins (current report) Not otherwise specified[5,9,11–14,18,20,29]
Laser (carbon dioxide)[17]
Photodynamic therapy[6,10,21]
Radiation therapy (postoperative)[25]
Tazarotene (topical, postoperative)[12]
UNSUCCESSFUL
Amputation Below elbow[26] *En bloc* at proximal joint[16]
Cryotherarpy (liquid nitrogen)[21]
Excision (Mohs with microscopic examination of margins)[23]
5-fluorouracil (topical)[21]
Interferon alfa-2a (subcutaneous)[7]
Isotretinoin (oral)[17]
Radiation therapy[16]
Trichloracetic acid (topical)[20]

a verrucous carcinoma[29] and another patient had a pigmented SCC *in situ* that clinically mimicked malignant melanoma.[5]

Verrucous carcinoma of the ventral fingers. Verrucous carcinoma of the skin (also referred to as epithelioma cuniculatum or carcinoma cuniculatum) is a well-differentiated variant of SCC that is often clinically mistaken for a wart. Approximately 90 percent of these cutaneous tumors are located on the feet. However, albeit rare, they also have been observed to occur on the hands.[29] Verrucous carcinoma of the right palm and fourth finger developed in a 31-year-old construction worker,[29] and bilateral verrucous carcinoma of the ventral fingers was observed in an 81-year-old man with an associated syndactyly involving the third web space of both hands.[14]

Differential diagnosis of SCC of the ventral finger. Mimickers of SCC of the ventral finger are listed in Table 2.[5,13,16–18,20,23–25,29] In some of these individuals, the cancer was concurrently present or mimicked either a benign tumor, a malignant neoplasm, or a localized condition.

Verrucae or only viral changes have also been observed pathologically in the ventral digit SCC. Our patient had an intermittently painful tumor of five years duration that had progressively enlarged. A chronic wart was initially considered in the differential diagnosis; however, the tumor symptoms, size, and location prompted the clinician to perform a

biopsy to exclude cancer. Although the initial specimen did not show wart or viral changes associated with the SCC, the excised residual tumor did reveal viral changes.

Treatment. The approach to therapy for SCC of the ventral digits is derived from the limited number of reported patients (Table 3).[5–14,16–18,20,21,23–26,29] Unsuccessful modalities were often described in individuals with advanced tumors. Many of the successfully treated patients—albeit some whose cancer diagnosis was significantly delayed—had amputation of the entire affected digit or *en bloc* removal of the digit at the joint proximal to the gross tumor involvement. Some of the patients with more extensive preoperative tumors also received postoperative tazarotene,[12] chemotherapy,[12] or radiation therapy[25] to prevent recurrence.

Local excision of the tumor, without the underlying tendons and bone, also provided eradication of the cancer. Our patient's malignancy required five stages of Mohs surgery to completely remove the tumor based on microscopic evaluation of the tissue margins. His cancer demonstrates that unsuspected subclinical tumor extension and adjacent tumor invasion may be present in patients who have SCC of their ventral digits.

Alternative treatments for patients with less extensive SCC *in situ* of their palmar digits included photodynamic therapy[6,10,21] and ablation using the carbon dioxide laser.[7]

Response to therapy. Most of the patients with SCC *in situ* or SCC of a ventral digit—regardless of size or initial delay in diagnosis—have a favorable outcome.[5–10,12–14,17,18,20,21,23–25,29] Simple or more extensive resection of the tumor is usually curative. Subsequent local recurrence[16] or metastases[16,26] of the tumor are uncommon.

CONCLUSION

SCC of the ventral digits is rare. Risk factors that may be associated with tumor development at this location in these individuals include local or systemic carcinogen exposure, congenital conditions, suppressed host immunity, coincident bacterial or viral infection, local radiation exposure, and trauma to the affected digit. Chronic dermatitis, epidermoid cyst, infection, keratoderma, melanoma, and/or verrucae are tumors and conditions that not only mimic but also can coincidentally occur at the site of palmar digit SCC. The mainstay of therapy is surgical removal of the cancer. This has been successfully performed by amputation of all or part of the affected digit or excision of the cutaneous malignancy with subsequent evaluation of margins to ensure complete removal of the tumor. The prognosis for patients with SCC of the ventral digits—regardless of the occasional delay in diagnosis, large tumor size, or both—is usually favorable following treatment of the cancer.

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